

Remarks

I. Status of the claims

Claims 1-10, 13-16 and 18-21 are pending in this application. Applicants amended independent claims 1 and 13 to more clearly recite the invention. Claim 21 has been amended to recite a microelement array being an array of micro-mirrors. Support for this amendment appears in the specification at page 3, line 14.

Applicants express their appreciation to the Examiner for meeting with the undersigned in a personal interview on December 4, 2003. As reflected in the Interview Summary mailed on December 12, 2003, the topics discussed were the obviousness rejections and the restriction requirement. The arguments presented by the undersigned during the interview are discussed in detail below.

II. Rejection of claims under 35 U.S.C. § 103(a)

The Examiner maintained the rejection of claims 1, 3-9, 13-15 and 17-19 under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 5,912,717 to Sugiyama et al. ("Sugiyama") in view of U.S. Patent No. 5,629,056 to Koike et al. ("Koike"). Applicants address this rejection in view of the claims now pending.

The Examiner relied on Sugiyama as a primary reference, but acknowledged that Sugiyama does not disclose interposing a microelement array between the radiation source and material. The Office Action refers to a mask between a source of radiation and a material in Figure 21 of Koike, with angles of irradiation (a) and (b) handwritten by the Examiner on the Figure (a copy is attached). The Examiner characterized Figure 21 as illustrating different oblique angles of irradiation onto a layer 26. The Examiner concluded that it would have been obvious to interpose a mask as disclosed in Koike into the process of Sugiyama in order to transmit light to generate multi-domains of alignment. Applicants traverse this rejection.

Claim 1 recites that multiple local zones of the material are exposed to radiation, the oblique angle of the radiation being uniform within each local zone but different between two or more zones. This achieved by interposing a microelement array between the source of the radiation and the material to generate locally different oblique radiation in one irradiation step. Independent claim 13 contains similar elements.

The Examiner's handwritten irradiation paths (a) and (b) do not constitute part of the Koike disclosure. Figure 21 originally discloses light following path "P," but that does not suggest the paths (a) and (b) that appear to approach the mask (60) at different angles and maintain those different angles as they approach the material. Moreover, the irradiation paths proposed by the Examiner do not appear to be "zonewise patterned" by the mask to generate "locally different oblique radiation" in one irradiation step. They also do not lead to "multi-domains of alignment" referred to by the Examiner at the top of page 3 of the Final Office Action. Even if light were to somehow randomly approach and exit the mask at any given angle as drawn in (a) and (b), the Examiner's interpretation appears to show a single local area of a material being irradiated from different oblique directions simultaneously. This differs from the method of claim 1, for example, where multiple local areas of a material are simultaneously exposed to irradiation of an oblique angle independently selected for each local area.

The practical difference between the two alternatives discussed above is clear. In the case of the Examiner's proposal, the irradiation of the one local area of layer 26 will not lead to a useful orientation of liquid crystals. The method of claim 1, on the other hand, not only results in useful orientation of liquid crystals, but produces different orientations at different local areas of choice using one irradiation step. For at least the reasons explained above, independent claim 1 and 13 should be patentable over the cited documents.

During the personal interview, the Examiner mentioned the possibility of amending the claims to recite that multiple adjacent local zones are exposed to the radiation. This was not understood. The areas to be irradiated do not necessarily have to be adjacent or otherwise contiguous, either in view of Sugiyama or in view of Koike. As long as multiple local zones of the alignment layer are exposed to radiation wherein the oblique angle of radiation is different between two or more zones but uniform within each local zone, and wherein the irradiation is applied in one irradiation step, the claimed subject matter is clearly patentable over the cited documents.

The Examiner cited U.S. Patent Nos. 5,929,201 and 6,001,277 and GB 2319093 in support of the rejection of claims 2, 10, and 16 when used in combination with Sugiyama and Koike. U.S. Patent Nos. 5,929,201 and 6,001,277 and GB 2319093

were cited only for teachings of certain embodiments of the inventions in the dependent claims, such as the irradiation energy, crosslinking of the material, and properties of liquid crystals. Those teachings do not fill the gaps missing in Sugiyama and Koike to suggest the inventions of independent claims 1 and 13. Claims 2, 10 and 16, which incorporate the limitations of the independent claims, should therefore be patentable for all the reasons mentioned in the earlier remarks.

III. Restriction

The Examiner maintained that claims 20-21 are directed to inventions that are independent or distinct from the invention originally claimed. The Examiner stated that the original claims recited a microelement array being a "microprism array," to the exclusion of the embodiments of a microelement array recited in claims 20-21.

The facts stated in support of the restriction requirement do not appear to be correct. The originally-presented claims did not limit the microelement array to a "microprism array." Claim 12 of the Preliminary Amendment filed on August 2, 2001, recited a "microelement array." Claims 1 and 13 subsequently incorporated that limitation. None of those claims limit the "microelement array" to a "microprism array." The specification makes quite clear that a hologram element, an array of light switches, a microlens array and a microprism array are all embodiments of a "microelement array." Applicants have not elected one embodiment over the other. Moreover, the scope of "microelement array" has already been examined and includes the embodiments recited in claims 20-21. Applicants respectfully request that claims 1-10 and 13-16 and 18-21 be examined together in this application.

IV. New Drawings

In addition to the rejections discussed above, the Examiner asked applicants in the personal interview to provide new Drawings to illustrate the embodiments of claims 4, 5, 18 and 19. Support for the new Figures submitted in response to this request appears in the respective claims.

Figure 1, already present in the application, illustrates the embodiment of claim 19. Figure 1 shows the use of a microprism array, wherein the following reference numerals are shown:

- 1 wall of the liquid-crystal cell
- 2 layer of the liquid-crystal alignment material
- 3 light
- 4 array of optical micro-elements, in this case microprisms
- 5 radiation from an oblique direction
- 6 zones of the first alignment type
- 7 zones of the second alignment type
- 8 opaque masking.

New Figure 2 illustrates embodiments of claims 4 and 5, with the following reference numerals:

- 1 wall of the liquid-crystal cell, bearing a layer of liquid-crystal alignment material
- 5 radiation from an oblique direction
- 10 liquid-crystal molecule
- 11 normal to the layer of liquid-crystal alignment material
- 12 plane including the normal to the layer and the direction of radiation
- 13 imparted tilt

Figure 2 illustrates the plane 12 including the direction of irradiation as well as the normal to the plane of the liquid-crystal molecules. It furthermore indicates the angle of the imparted tilt 13 which, as defined in claim 5, preferentially exceeds 45° to the plane of the layer. The angle given in Figure 2 exceeds 45°.

Figure 3 illustrates the subject matter of claim 18. The microelement array in this particular instance is a microlens array. The following reference numerals are used:

- 1 wall of a liquid-crystal cell
- 2 layer of liquid-crystal alignment material
- 3 radiation
- 4 array of optical micro-elements, and this case microlenses
- 5 radiation from an oblique direction
- 6 zones of a first alignment type
- 7 zones of a second alignment type.

Applicants have also added Figures 4 and 5 to illustrate the subject matter of claims 20-21. Figure 4 illustrates an embodiment of claim 20 using the following reference numerals:

- 1 wall of a liquid-crystal cell
- 2 layer of liquid-crystal alignment material
- 3 radiation
- 4 array of optical micro-elements, and this case surface hologram elements
- 5 radiation from an oblique direction
- 6 zones of a first alignment type
- 7 zones of a second alignment type.

Figure 5, illustrates an embodiment of claim 21, using the following reference numerals:

- 1 wall of a liquid-crystal cell
- 2 layer of liquid-crystal alignment material
- 3 radiation
- 4 array of optical micro-elements, and this case micro-mirrors
- 5 radiation from an oblique direction
- 6 zones of a first alignment type
- 7 zones of a second alignment type.


Given that the embodiments of Figures 4 and 5 (for claims 20 and 21) and the embodiments of the other Figures (for claims 18 and 19) share several common features, as shown in the Figures, applicants do not understand why it would be an undue burden to search all embodiments in one application.

V. Conclusion

In view of the amendments and remarks above, the pending claims should be examined together in this application and should be in condition for allowance. If there is any fee due in connection with the filing of this Amendment, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

By: 
Steven J. Scott
Reg. No. 43,911

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Attachments: Figures 2-5

U.S. Patent

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Attachment

Fig. 21

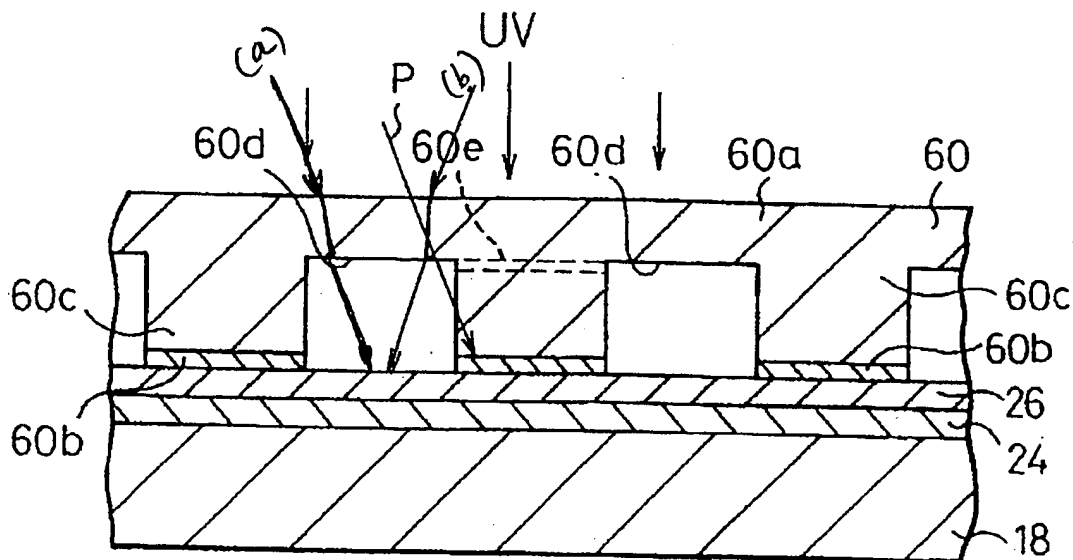


Fig. 22

